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REMARKS

The above-identified application is United States application serial number 10/737,374 filed on December 16, 2003.

Claim Rejections - 35 USC § 101

Claims 21-25 are rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter. In response, Applicant has amended Claims 21-24 to recite "computer executable instructions embodied in a computer readable medium". Removal of the rejection under 35 U.S.C. 101 is respectfully requested.

Claim Rejections - 35 USC § 102

Claims 1-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Chung *et al.* (US 6,195,760) (hereinafter "Chung"). Claim 1 recites "the persistent memory unit is configured to receive the checkpoint data via a direct memory write command from a primary process, and to provide access to the checkpoint data via a direct memory read command from a backup process, through the network interface". (Emphasis added). One cited portion of Chung discloses a hot backup system where each copy of an application can process client requests and states are synchronized among multiple copies. (Chung, col. 2 lines 7-14). A Checkpoint Server (110) connected periodically receives from each fault-protected application module running on the network the most current state of that application. (Chung, col. 4 lines 41-44). The state is then stored in the memory of the Checkpoint Server. Id. Chung does not disclose or suggest that direct memory write and read commands are used, however. Paragraph [0022] of the present specification highlights some of the features available in a system that transfers data directly to or from a memory unit. Further, in paragraph [0002] the background section, Applicant acknowledges that traditional computers store the checkpoint data in either system memory coupled to the computer's processor, or on other input/output (I/O) storage devices such as magnetic tape or disk. Memory devices traditionally used for storing checkpoint information, such as Checkpoint Server 110 in Chung, do not disclose or suggest direct memory read and write commands, however. Further still, Chung does not teach or suggest whether the memory in

Checkpoint Server 110 is persistent. Claim 1 is allowable over Chung for at least these reasons.

Claims 2-9 depend from Claim 1 and include features that further distinguish them from the prior art. For example, Claim 5 recites "the persistent memory unit is configured to store multiple sets of checkpoint data sent from the processor at successive time intervals." The cited portion of Chung teaches periodically taking snapshots of the running state and storing such state in a stable storage media. (Chung, col. 1, lines 49-58). Chung teaches that only the last stored state of a failed application is retrieved from the memory of Checkpoint Server, and thus does not disclose or suggest that multiple sets of the checkpoint data is stored. (Chung, col. 1, lines 49-58; col. 4, lines 45-48). Further, there is no motivation in Chung to store more than the last state since only the last state is retrieved. Claim 5 is distinguishable from the prior art for at least this additional reason.

Claim 6 depends from Claim 5 and recites "the persistent memory unit provides the multiple sets of checkpoint data upon request by the backup process at one time." Since Chung does not disclose or suggest retrieving anything other than the last state, Claim 6 is distinguishable from Chung for at least these additional reasons.

Claim 8, recites "the persistent memory unit is configured as part of a remote direct memory access-enabled system area network." Chung does not disclose or suggest that the memory in the Checkpoint Server is part of a remote direct memory access -enabled network. Claim 8 is distinguishable from Chung for at least these additional reasons.

Claim Rejections - 35 USC § 103

Claims 10-13, 17-28, 32-33 and 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung and in further view of Stiffler *et al.* (US 6,622,263) (hereinafter Stiffler).

Independent Claim 10 recites "providing the checkpoint data to a backup process via a direct memory read command from the backup process." Chung does

not disclose or suggest using direct memory read commands from the backup process, however. Claim 10 is allowable over Chung for at least these reasons.

Claims 11-20 depend from Claim 10 and include features that further distinguish them from the prior art. For example, Claim 17 recites "storing access information to the physical addresses of the checkpoint data in the persistent memory unit when the primary process opens a memory region for the checkpoint data; and providing the access information to subsequent requestors of the checkpoint data." The cited portions of Chung do not teach or suggest the features, but rather describe a table (200) of information for replicated application modules. The table includes the identities of the registering application modules and the host machines on which they are running, the particular replication strategy (cold, warm or hot backup style) and the degree of replication to be associated with each registered application module, and which registered replication strategy is used by the ReplicaManager to set the operating state of each backup copy of the application module as well as to maintain the number of backup copies in accordance with the degree of replication. (Chung, col. 3 lines 6-15). The table in Chung does not include any information regarding the checkpoint data and thus does not "store access information to the physical addresses of the checkpoint data in the persistent memory unit when the primary process opens a memory region for the checkpoint data". Claim 17 is distinguishable from Chung for at least these additional reasons.

With regard to claim 18, Chung does not disclose or suggest "establishing a connection to a process requesting access to the checkpoint data and binding the access information to the connection." Chung teaches that the ReplicaManager daemon process includes the replication information for all registered application modules in the network. (Chung, col. 5 lines 21-23). Chung does not disclose or suggest that the replication information includes access information to the checkpoint data. Chung further does not disclose or suggest binding the access information to the connection with a process requesting access to the checkpoint data. Claim 18 is distinguishable from Chung for at least these additional reasons.

Claim 19 recites "verifying authentication information from the subsequent requestors." Stiffler is cited as teaching this feature, however, Stiffler only discloses exception handler software to check the write permission information for a page of checkpoint information. (Stiffler, Fig. 3, 302, col. 8 lines 9-18). Applicant submits that write permission information is not equivalent to "authentication information from the subsequent requestors." The write permission information for the page in Stiffler is associated with the page, not the subsequent requestors. Claim 19 is distinguishable from Chung and Stiffler, alone and in combination, for at least these additional reasons.

Claim 20 recites "authenticating a persistent memory manager during initialization of address protection and translation tables on the persistent memory unit." Chung does not disclose or suggest authenticating a memory manager. Further the table 200 in Chung does not include address protection and translation tables on the persistent memory unit. Claim 20 is distinguishable from Chung for at least these additional reasons.

Independent Claim 21 recites computer executable instructions "operable to: receive a direct memory access command from a remote processor via a network, wherein the direct memory access command includes a reference to a persistent memory virtual address". Chung does not disclose or suggest using direct memory access commands for Checkpoint Server 110. Further still, Chung does not teach or suggest that the memory in Checkpoint Server 110 is persistent. Claim 21 is allowable over Chung and Stiffler, alone and in combination, for at least these reasons.

Claims 22-25 depend from Claim 21 and include features that further distinguish them from the prior art. For example, Claim 22 recites "provide address context information to the processor." The Examiner cites the pathname location of each copy of the application module on the host computer in Chung (Fig. 2, 200) as teaching this feature, however, Applicant submits that the pathname of an application module is not the same as address context Information. Claim 21 is allowable over Chung and Stiffler, alone and in combination, for at least these additional reasons.

Claim 23 recites "store multiple updates to the checkpoint data sent at successive time intervals." The cited portion of Chung teaches periodically taking snapshots of the running state and storing such state in a stable storage media. (Chung, col. 1, lines 49-58). Chung teaches that only the last stored state of a failed application is retrieved from the memory of Checkpoint Server, and thus does not disclose or suggest that multiple sets of the checkpoint data are stored. (Chung, col. 1, lines 49-58; col. 4, lines 45-48). Further, there is no motivation in Chung to store more than the last state since only the last state is retrieved. Claim 23 is distinguishable from the prior art for at least this additional reason.

Claim 24 recites "provide multiple sets of checkpoint data to the backup process at one time." Chung does not disclose or suggest retrieving anything other than the last state. (Chung, col. 1, lines 49-58; col. 4, lines 45-48). The Examiner states that the Replica Manager in Chung stores information necessary to effect recovery of an entire host computer running several different application modules, Fig. 2, 200, col. 5lines 21-30, however, supplying one copy of checkpoint to each of multiple backup processes in Chung is not the same as supplying multiple sets of checkpoint data to the backup process in Claim 24. Claim 24 is distinguishable from Chung for at least these additional reasons.

Claim 25, recites "the persistent memory unit is configured as part of a remote direct memory access-enabled system area network." Chung does not disclose or suggest that the memory in the Checkpoint Server is part of a remote direct memory access -enabled network. Claim 25 is distinguishable from Chung for at least these additional reasons.

Claim 26 recites "means for communicatively coupling a persistent memory unit to a network that enables direct read and write access to the persistent memory unit". Chung does not disclose or suggest that the memory in the Checkpoint Server is persistent memory, or that the memory enables direct read and write access. Claim 26 is distinguishable from Chung for at least these additional reasons.

Claim 27 recites "means for providing context information regarding the addresses to the primary process and the backup process." The Examiner cites the pathname location of each copy of the application module on the host computer in Chung (Fig. 2, 200) as teaching this feature, however, Applicant submits that the pathname of an application module is not the same as address context information. Claim 27 is allowable over Chung for at least these additional reasons.

Claim 32 recites "transmitting checkpoint data regarding the operational state of the primary process in the persistent memory unit via a direct memory access write command." Claim 33 recites "overwriting the checkpoint data in the persistent memory unit with current checkpoint data via a direct memory access write command." Claims 35, 36, and 37 recite the use of direct memory access read commands. Again, Chung does not disclose or suggest the use of direct memory access read or write commands to access the checkpoint data. Claims 32, 33, 35, 36, and 37 are allowable over Chung for at least these additional reasons.

Claims 14-16, 29-31 and 34 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Chung and in further view of Stiffler and St. Pierre *et al.* (US 6,141,773) (hereinafter St. Pierre).

Claim 14 recites "appending updated checkpoint data to at least one previous set of the checkpoint data." Claim 29 recites "means for creating multiple sets of checkpoint data by appending updated checkpoint data to at least one previous set of the checkpoint data." Claim 34 recites "appending updated checkpoint data to a previous set of the checkpoint data via a direct memory access write command." In contrast, St. Pierre identifies segments of data that have changed and a backup is formed of the identified changed segments. (St. Pierre, col. 5 lines 30-63). St. Pierre does not teach or suggest that the backup formed of the changed segments is appended to at least one previous set of the checkpoint data. Claims 14, 29, and 34 are distinguishable from the cited prior art for at least these additional reasons.

CONCLUSION

The application, including claims 1-37, is believed to be in condition for allowance and notice to that effect is solicited. Should any issues remain that might be subject to resolution through a telephone interview, the examiner is requested to telephone the undersigned at (949) 350-7301.

I hereby certify that this correspondence is being facsimile transmitted to the USPTO. Central Number at (571) 273-8300 on the date shown below:

(Signature)

Joy C. Nao
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November 22, 2006
(Date)

Respectfully submitted.

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